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COOPERATIVE EXTENSION WORK IN AGRICULTURE AND HOME ECONOMICS

U. S. Department of Agriculture  
and State Agricultural Colleges  
Cooperating.

Extension Service, Office of  
Cooperative Extension Work,  
Washington, D. C.

HOME WATER SUPPLY AND HYDROELECTRIC POWER PLANTS

Excerpts from 1922 Annual Reports  
of State and County Extension Agents.

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This circular is one of a series issued by  
the Office of Cooperative Extension Work as  
a part of its informational service to State  
and county extension workers. The material  
contained herein is not released for printed  
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## Connecticut

The extension rural engineer of the college has been available for extension work since February 1, and the home demonstration agents in three counties have taken advantage of the fact. They have arranged for the engineer to give talks on heat, light and power for the farm home and to make home visits upon request. The reasons why such help is valuable are as follows:

- (1) Many farmers desire these improvements but do not know the best system suited to existing conditions.
- (2) In some cases equipment has been installed but is not working satisfactorily.
- (3) In many cases the cost can be materially lessened if the farmer can do some of the labor.
- (4) A farmer after receiving suggestions is better able to deal with the plumber. In one case a plumber stated that to install a septic tank as required would cost \$350. The man did it by following a blue-print and suggestions for less than \$20.

The method used by the engineer is to visit farms by request, examine conditions and make recommendations as to type of system, source of supply, and approximate cost. When necessary a blue-print is prepared and sent to the farmer. The reports show but a limited number of systems actually installed but in

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\*No attempt is made to cite all references to home water supply and hydroelectric power plants in this circular. Only selected extracts showing typical methods employed and results secured in some States are included. Owing to differences in terminology used in the various States and to other local conditions, the information contained herein should be reviewed by the State subject-matter specialist concerned before incorporating any part of it in the extension plans for the State.



nearly every case something of value has resulted. In some cases defective installation was remedied. Several farmers are waiting until spring to start, and others are awaiting better financial conditions. The following recommendations are made for improving the work:

- (1) Study carefully the farm income before making recommendations.
- (2) Recommend simple unit which can easily be added to.
- (3) Arrange for more study tours. - M. Estella Sprague, State Home Demonstration Leader, Connecticut Agricultural College, Storrs.

### Georgia

Several women have rearranged their kitchens to save steps. Two funnels for carrying water from the kitchen have been installed. One Delco light-plant system was put in by two families to be used jointly. These two families also have a joint water-works system, the water being pumped from a nearby spring. In one home, water was run into the cellar, whereas before it had had to be carried by hand from the kitchen. - Pauline Haslett, Home Demonstration Agent, Columbia and Lincoln Counties, Appling.

### Kentucky

Eight farmers have installed very simple barrel and sink water systems in their houses. It takes only a sink, drainage, guttering, barrels and a few hours' labor to put in this convenience. - Sidney Sandifer, Home Demonstration Agent, Whitley City, McCreary County.

### Minnesota

A family living in Waseca County began a water system 12 years ago. They developed it part at a time, paying for each part when made; now they have a complete water system of the gravity type and a septic tank sewage-disposal system. These systems should last the rest of their owners' lives and will need very little in the way of repairs. These families have never been harassed with debt on account of this system and have carried very little water. The housewife has always had time for recreation and has kept young because of this relief. A family living in Washington County began a system about 20 years ago, putting in a unit at a time. Now the son and his family are enjoying the system that the father and mother built up. The latter have a power-service electrically operated water system in their new home. A family living in Jackson County installed a simple gravity water system in their home about 11 years ago. The man of the house installed the system himself. He soon got the neighbors interested; and the work has progressed until I am told that nearly every home in the township has a water system and a sewage disposal plant. This development shows how one man who is handy with tools and is possessed of a community spirit has revolutionized his township in the way of making general the possession of these basic home conveniences. - Juniata L. Shepperd, Extension Home Economist, Department of Agriculture of the University of Minnesota, St. Paul.



### Nebraska

Of the 125 modern water and sewer systems now in the county, 12 were installed by farmers during the last year. These men asked the agent for the latest information in regard to water and sewer systems, and it was sent to them from the engineering department of the State extension service. - George E. Davis, County Agent, Saint Paul, Howard County.

### Nevada

A gravity water system from creek to kitchen has been completed on the A. B. Gardner ranch at Sunnyside; but since it does not give all the pressure desired, it will be supplemented in 1923 by a hydraulic ram installation. The water system is 90 per cent complete on the A. C. Kirkeby ranch in Spring Valley. A demonstration well was bored with a hand auger to the depth of 25 feet, and an adequate supply of good water was secured. Due to the absence of casing, this well caved in badly when an attempt was made to install the pump; and it was necessary to abandon the bored well and dig it by hand, using timber cribbing. The pump has been installed, but connections have not yet been made with the house plumbing system. In connection with the bored well, it was found necessary to shoot the well after water had been reached. A demonstration of the methods and effectiveness of this measure was made at the time. A domestic water system is 90 per cent complete on the R. T. Swallow ranch. Plumbing fixtures have been installed in the houses; the artesian well for supplying water has been drilled, but connections have not been completed. - Thomas R. King, County Agent, Ely, White Pine County.

### North Carolina

Two hydraulic rams were put in this summer with the assistance of E. R. Raney, farm engineer. Tanks were installed in both cases and complete water systems placed in the dwellings, with a line to the barns to furnish water for the stock. - U. A. Miller, County Agent, Taylorsville, Alexander County.

### North Dakota

On two farms the county agent planned the water works so that water could be conducted to where it was most needed. A cistern, having a diameter of 12 feet and a jug-shaped top about 8 feet high, was built in the top of a hill back of the buildings. The extension agent built the forms in such a way that they could be used for building concrete walls in pit silos. The water is carried through pipes into the kitchen of the farmhouse. Later, pipes will be run to the barn and hog pens. A windmill pumps the water into the cistern. On another farm, pipes were laid in such a way that the water in a 14-foot well on top of a hill was siphoned down to a more convenient place for the stock. At the same time this did away with the necessity for pumping. The size of the stream was governed by a valve to correspond to the amount of water coming into the well. - J. Clayton Russell, County Agent, Beach, Golden Valley County.



## Oregon

A model home water supply and septic tank system was exhibited at county and State fairs. Plans and specifications for these have been prepared in blue-print form for circulation by the extension service. Plans for water supply systems have been sent to 104 persons and plans for concrete septic tanks to 48. - P. V. Maris, Director of Extension Service, Oregon Agricultural College, Corvallis.

## Virginia

Farm hydroelectric power project. - The object of water power development is to demonstrate to the farmer the dormant possibilities in small streams and to show him how to harness the wasted power for his profit and for the increased convenience and comfort of himself and family. There are in the State of Virginia many small streams, some located in each county, which considered individually seem useless as producers of power, but considered collectively represent an enormous waste of power. These streams, if harnessed, would be of inestimable value when considered in terms of the comfort brought to the farm home and the saving in time and labor. Such streams vary in size from the tiny stream of the steep mountain-side capable of developing a fraction of a horsepower, to the larger streams representing 25 or 30 horsepower. As an example, a stream in the mountain section of Virginia, with a flow of 15 to 30 gallons per minute, was developed to furnish power for use in the home. With the use of a storage battery in connection with the installation, it produced power sufficient for lights, electric iron, sewing machine, washing machine, electric fan, vacuum cleaner, ice cream freezer, coffee grinder, cream separator, water pump, churn, small automatic refrigerator, grindstone, small shop machines, and other labor-saving devices. This outfit cost only \$450 installed. The power, if used continuously and paid for at the city rate of 10 cents per kilowatt hour, would cost the user \$18 per month. When this is compared with the average city family's electricity bill of \$3 or \$4 per month, some idea may be obtained of the power that is going to waste from even so small a stream.

Another plant for a stream heretofore regarded useless as a source of power can be installed to operate a sawing or milking machine, feed grinder, corn sheller, grain elevator, concrete mixer, electric range, hay hoist and many other farm and household machines. This plant is estimated to cost \$1100. The two plants mentioned above, considering the amount of power generated, represent average costs. During the year, 61 surveys were made for hydroelectric installations. Of these projects 5 were discarded as impracticable because of local conditions, such as the scattered nature of the community or the great distance from the place of consumption. The average stream surveyed will develop from one to three horsepower, at an average cost of about \$500. Due to the increasing demand from farmers for assistance and information in regard to small plants, the department of agricultural engineering will endeavor to give all possible aid in the first installations in each community. When a call for aid is received an engineer is sent to measure the stream and estimate the available power; afterwards an estimate of the cost, including a list of the necessary equipment, is furnished the farmer. If the owner then decides to carry out the work, an engineer will make a few visits while the plant is being installed to give such assistance and advice as is needed to make the demonstration a success.



A typical installation.- The installation of a hydroelectric plant on the farm of H. P. Givens was probably the best work in hydroelectric development, not only because of the increase of comforts to a farm home, a neighbor's home, and a community church, but because of the influence it has had on the demand for similar installations in the same section. This project is of particular interest for several reasons: First, it was successfully installed in a community where a similar plant, owned and installed by an electrician, had failed because of the lack of advice on hydraulic problems; second, it represents a very small practical development of power from a farm stream; and third, it was a successful plant even though installed in opposition to the recommendations of the water wheel manufacturers. The survey was made in February, 1922, when the flow of the spring was 30 gallons per minute. The spring is 1,500 feet from and 135 feet above the residence. An estimate on the equipment was submitted to Mr. Givens, who, after careful consideration, decided to proceed with the work.

Through correspondence, secondhand 2-inch pipe and copper wire were found at Camp Lee which greatly reduced the cost. The water motor, generator, storage battery and switchboard instruments were then secured and everything gotten in readiness for the construction work. When the equipment arrived Mr. Givens was given assistance with the construction of an earth dam and pipe line. At intervals along the pipe line the water motor was attached and tests made. Upon completion of the pipe line from the dam to the basement of the house, the water motor was attached and set on a base in alignment with a 250-watt generator. The house was wired, the switchboard made and connected to the battery and generator, and everything made ready for belting the water motor to the generator. As the speed of the motor at full load could not be determined except by trial, the size of pulley for the generator was not known. A large walnut block was keyed on the generator shaft and chiseled into a pulley by using the storage battery to run the generator as a motor. After several trial runs the pulley was cut to the proper diameter, and the plant was put into operation by opening the valve in the pipe line. The valve is so arranged that an extension stem can be fitted so that the plant can be started or stopped from the bedroom. The switchboard was constructed at a cost of about \$20. On the switchboard was installed a reverse current cut-out to prevent the batteries from running the generator as a motor, in case the water motor should be slowed down for any reason. This plant now supplies light and limited power to two farms and a community church. It cost only \$450, installed complete, and the cost of operation is negligible.

Water supply and sanitation project.- In response to the growing demand for water in the home, water supply campaigns have been conducted in two counties with great success. In addition to the regular campaigns, assistance with water supply problems has been given to farmers in many counties throughout the State. During the year, 86 water supply surveys were made and advice given on the installations. In each case an estimate and a list of materials were furnished. The plants ranged from the complete systems including pumping outfit, pipe and bathroom fixtures, costing from several hundred to \$1000, to the simpler system to relieve the kitchen drudgery, costing only a few dollars. It is with the latter type that the



most efficient work has been done. In many instances it was found that an expenditure of from \$10 to \$25 for a few feet of pipe, a barrel, and a kitchen sink would furnish running water for the housewife, who had no idea that she could enjoy such a comfort without spending a large sum of money.

A water supply installation.- Many interesting pieces of work on water systems were handled, but perhaps the most prominent was the following project. This was interesting not because of mechanical difficulties but because of the owner's hostility toward any improvements in the home. After a survey of the premises it was found that the housewife was walking 140 miles per year and expending enough energy in lifting water to do the work of two horses plowing 11 acres of land. When asked if we could assist him in his water supply problem, Mr. Blank answered no, that he would soon die any way and that he did not want to spend any money. A son finally consented to expend \$50 toward putting water in the kitchen if we would help install the system and "make it work." A small hydraulic ram with overhead storage, a kitchen sink, and a waste pipe were purchased for \$49. When the equipment arrived a demonstration was given on the installation and care of a ram. It was attended by neighboring farmers and several members of the home economics club. Mr. Blank contended that the outfit would not work even up to the time that the ram pumped the water into the tank. Since enjoying the comforts of water in the kitchen, he has planned to install bath fixtures and other conveniences and is even considering the development of a nearby small stream for electric lights and power. - Charles E. Seitz, Extension Rural Engineer, Virginia Polytechnic Institute, Blacksburg.

### Washington

The water supply projects involve the problems of gravity supply, lifting by hydraulic ram or pumping with some kind of power. I look over the grounds, the source of supply, and the needed distribution, and decide what is the most advantageous system for that particular situation. I give all the advice I can as to installing, where ram or pump may be procured, and whether elevated tank, hydropneumatic tank or direct pumping from well will be best. Many farmers located on the hillsides have small streams which could be used for the development of power for lighting and for running milk separators, washing machines and the like, at a small initial outlay, with little expense for upkeep except from the natural deterioration due to use. I visited and planned such power plants on 19 farms during the year. I find that they can often be installed at an outlay of from \$250 to \$300 upward. Three types of water wheel are found adapted to varying conditions, namely: undershot and overshot water wheels for low heads, turbine wheels for medium heads with good supply, and Pelton impulse wheels for small supply with high head. Inspection of the ground, the supply, the reservoir possibilities and other conditions is made, and the most practical installation is advised. - A. B. Crane, Extension Rural Engineer, State College of Washington, Pullman.



The extension rural engineer visited 8 homes in 4 communities to give advice on water systems and septic tanks. As a result of his work last year and this, 13 water systems and 2 septic tanks have been installed. As a result of one of the home visits, the owner, J. Boehme, changed his plans for an overhead tank and installed instead an electrically driven system which is proving highly satisfactory. Eight farmers who have visited his demonstration have installed similar systems. Tours will be made this fall to visit the demonstrations. - Inez J. Arnquist, Home Demonstration Agent, Spokane, Spokane County.

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